

TEST REPORT

of the accredited test laboratory

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Technology/ EMCDepartment:
Testing Body for
Communication
Technology/ EMC

TÜV®

Applicant: NIVELCO PROCESS CONTROL CO.
Dugonics u. 11.
H-1043 Budapest

Tested Product: Level probing radar

FCC-ID: S7W-WES100

Manufacturer: NIVELCO PROCESS CONTROL CO.
Dugonics u. 11.
H-1043 Budapest

Output power / field strength: 53,8 dBµV/m AV **power supply:** 20-32 VDC
maximum @3m

Frequency range: 24,8 GHz **Channel separation:** N/A

Standard: FCC: 47 CFR Part 15 (October 1, 2011 edition)

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DVR 3002476**TUV Austria Services GmbH**
Test laboratory for EMCDeputy
Supervisor of EMC-laboratory:

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21.03.2013

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checked by:

Ing. Stefan Matzner

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The results of this test report only refer to the provided equipment.

LIST OF MEASUREMENTS

The complete list of measurements called for in 47 CFR 15 is given below.

SUBCLAUSE	PARAMETER TO BE MEASURED	PAGE
	Intentional Radiators	
	Test object data	3
15.209(a)	Radiated emission limits; general requirements	4-14

TEST OBJECT DATA

General EUT Description

This RF device is a module used as a level probing radar and is working under the provisions of 15.209 "Radiated emission limits; general requirements".

2.1033 (c) Technical description

2.1033 (4) Type of emission: Pulse modulation with an on/off cycle of 1:100.

2.1033 (5) Frequency range: Fixed frequency: 24,8 GHz.

2.1033 (6) Power range and Controls: The maximum field strength at 3m distance is 53,8 dBµV/m average.

2.1033 (7) Maximum output power rating: see above.

2.1033 (8) DC Voltage and Current: 20-32V DC
maximum current consumption: 20 mA

The Device can be supplied with 3 different antennae. The Antenna only varies in size and therefore in antenna gain. All measurements were performed with all three Antennae.

Tests were performed 25th and 26th February 2013.

Radiated emission limits; general requirements

§ 15.209 (a)

LIMIT

SUBCLAUSE 15.209(a)

Frequency (MHz)	Field strength (microvolts/meter)	Measure- ment dis- tance (meters)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100 **	3
88–216	150 **	3
216–960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 MHz, 76–88 MHz, 174–216 MHz or 470–806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§ 15.231 and 15.241.

All measurements were performed over the frequency range 9 kHz up to 100 GHz. However graphics are only available starting at 30 MHz up to 18 GHz. Measurements outside this frequency range are not yet automatized. Measurement results above 18 GHz are provided tabellary. Below 30 MHz no emission above noise level was found.

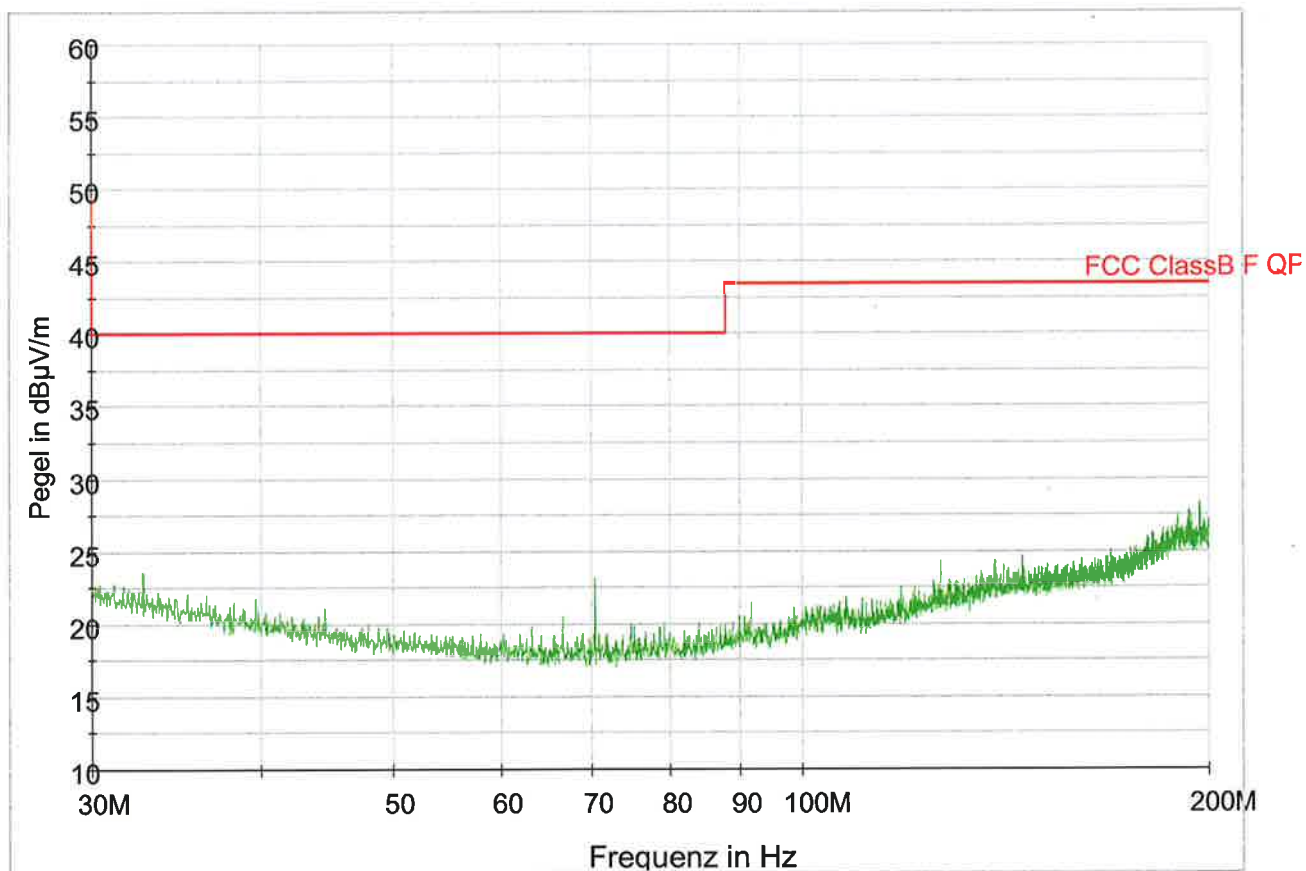
Test Equipment used: NT-100; NT-110/1; NT-111/1; NT-112/1; NT-122; NT-126; NT-129; NT-131; NT-139;
NT-150; NT-151; NT-207; NT-211; NT-214; NT-216; NT-218; NT-219; NT-337; NT-344;
NT-500; NT-520/1; NT-559

Radiated emission limits; general requirements

§ 15.209 (a)

Measurement with Peak-Detector (green line) and Average-Detector (magenta line):

Frequency: 24,8 GHz, smallest antenna



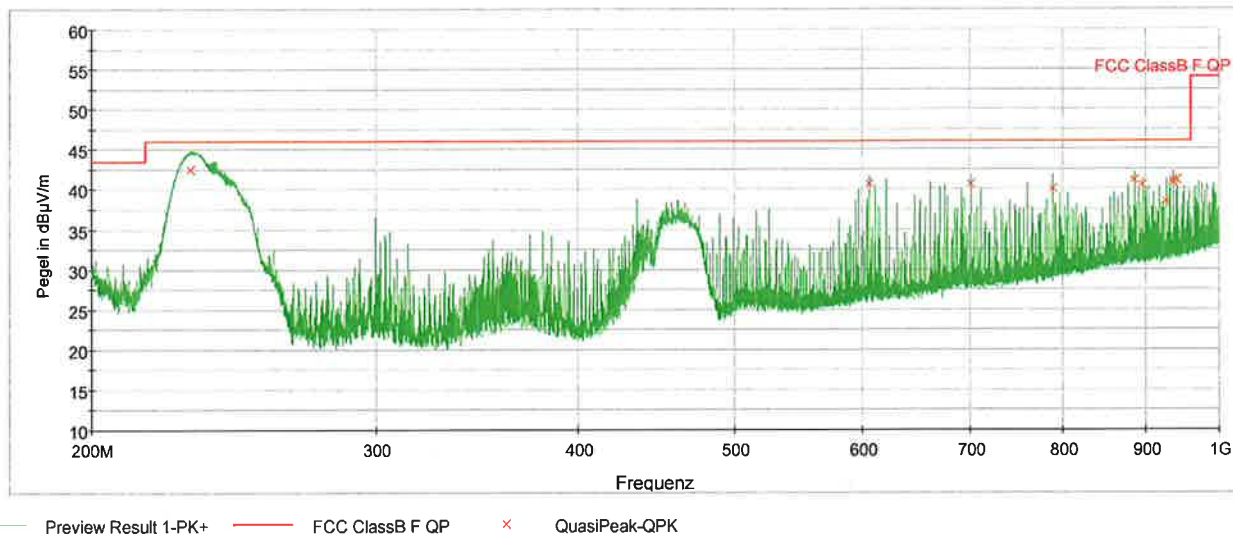
Preview Result ~~1-PK~~+FCC ClassB F QP QuasiPeak-QPK

Radiated emission limits; general requirements

§ 15.209 (a)

Measurement with Peak-Detector (green line) and Average-Detector (magenta line):

Frequency: 24,8 GHz, smallest antenna



Peak List:

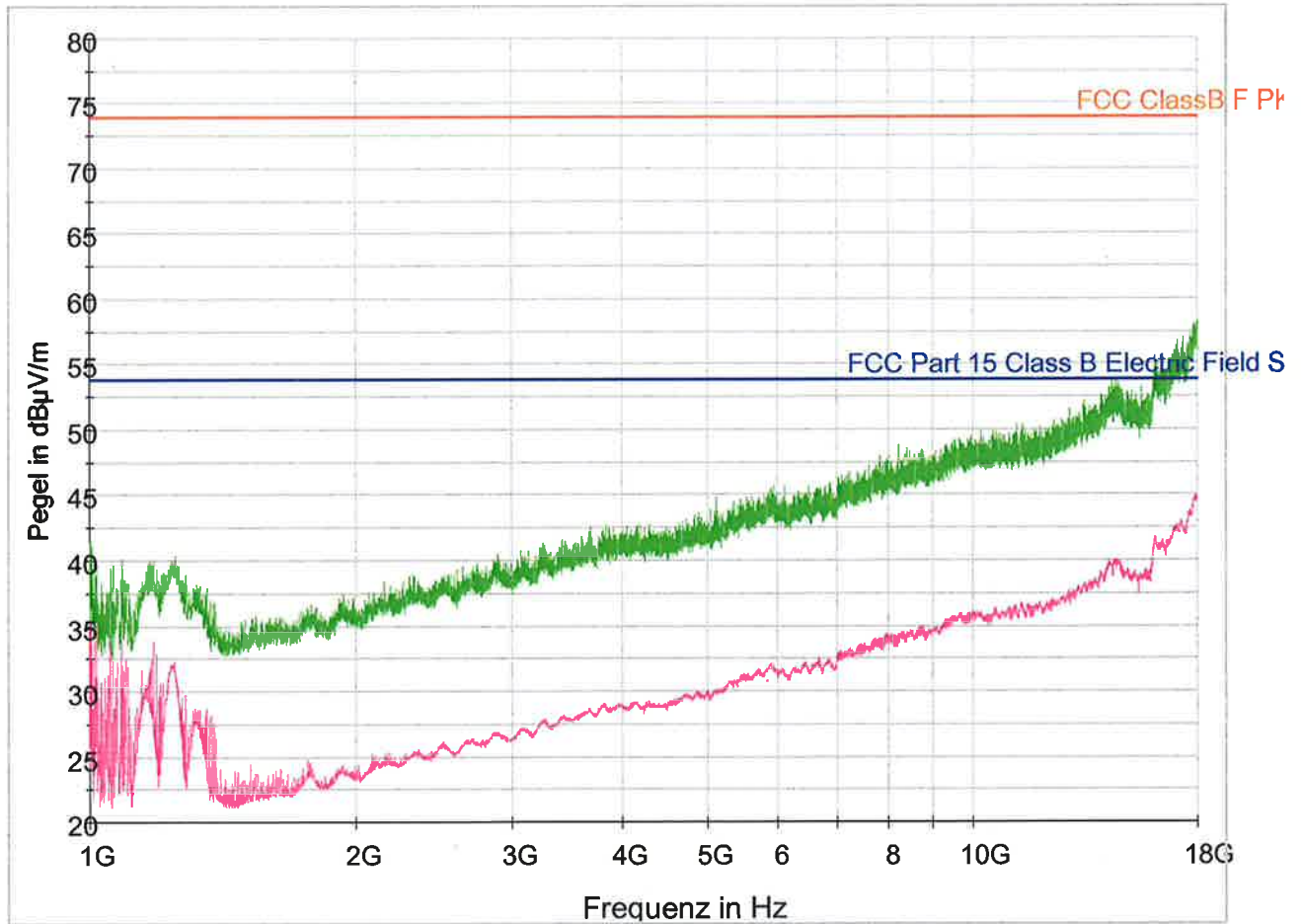
Frequency [MHz]	QP Level [dBµV]	Limit [dBµV]	Margin [dB]	Antenna polarization
230,60	42,46	46,00	3,54	Vertical
606,25	40,67	46,00	5,33	Vertical
701,35	40,64	46,00	5,36	Vertical
789,25	40,00	46,00	6,00	Horizontal
886,75	41,16	46,00	4,84	Horizontal
896,30	40,58	46,00	5,42	Horizontal
927,00	38,48	46,00	7,52	Horizontal
935,70	40,75	46,00	5,25	Horizontal
936,65	41,20	46,00	4,80	Horizontal
941,45	41,12	46,00	4,88	Horizontal

Radiated emission limits; general requirements

§ 15.209 (a)

Measurement with Peak-Detector (green line) and Average-Detector (magenta line):

Frequency: 24,8 GHz, smallest antenna



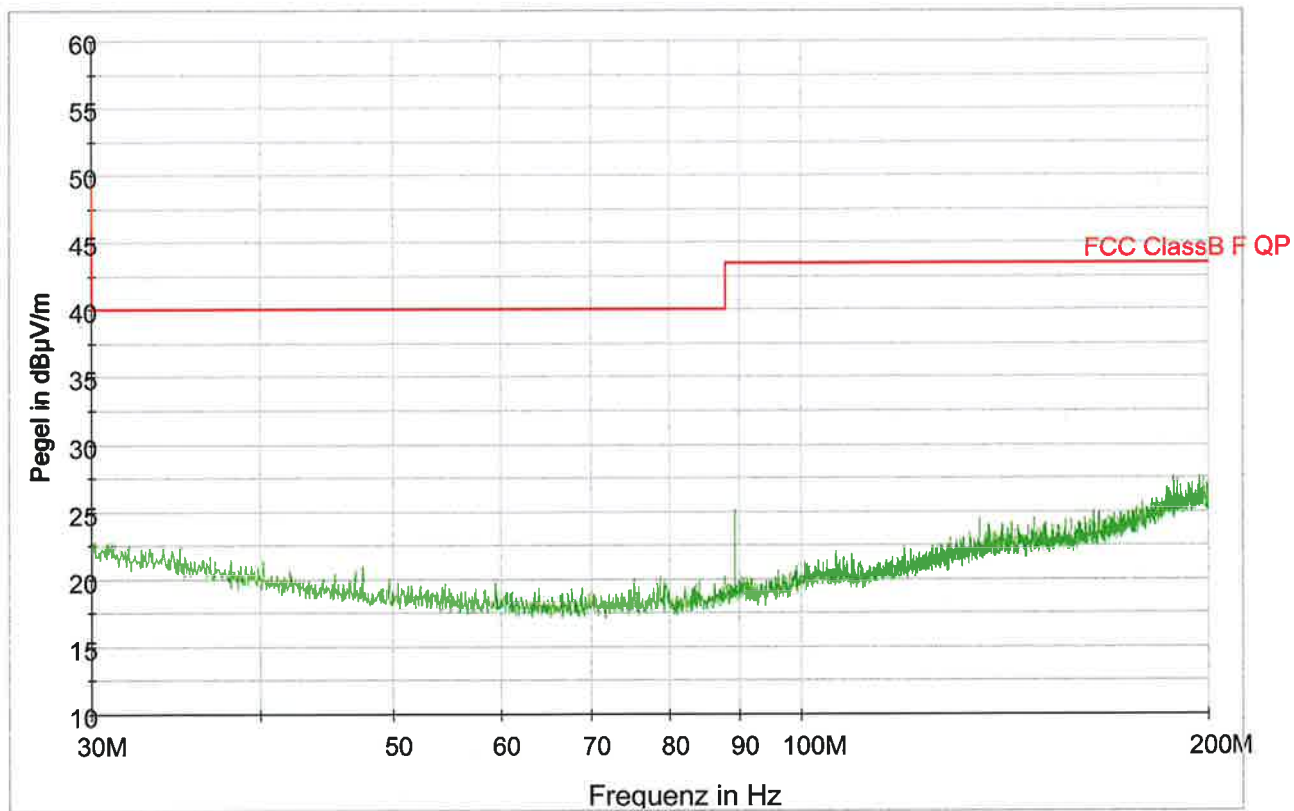
— Preview Result 2-AVG Preview Result 1-PK + FCC Class B Electric Field Strength — FCC Part 15 Class B Electric Field Strength

Radiated emission limits; general requirements

§ 15.209 (a)

Measurement with Peak-Detector (green line) and Average-Detector (magenta line):

Frequency: 24,8 GHz, middle antenna



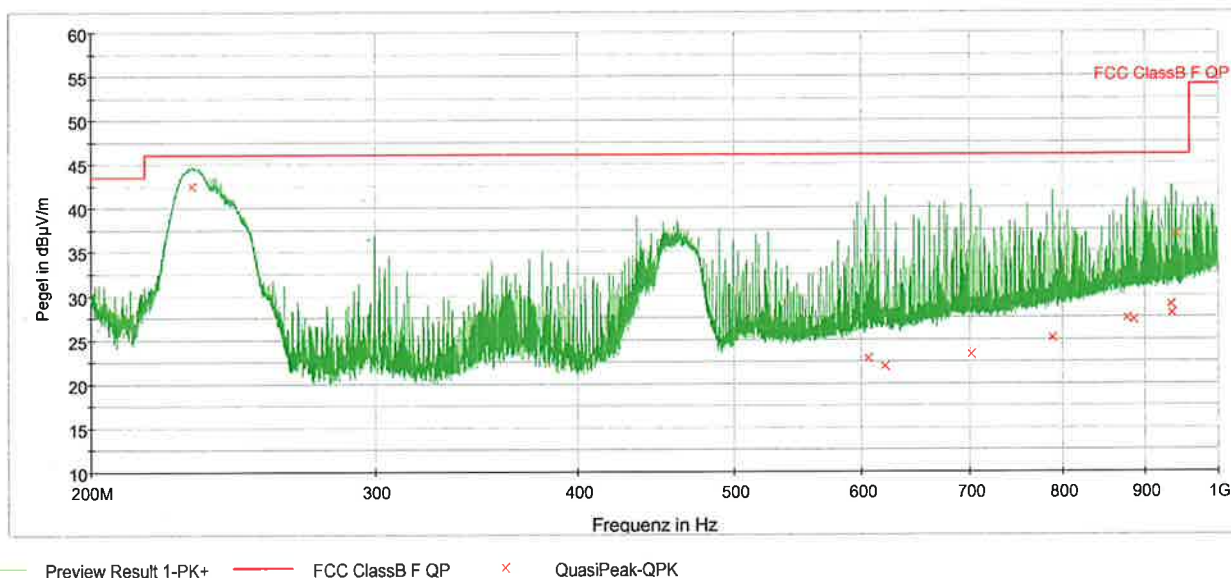
Preview Result 1-PK+ FCC ClassB F QP

Radiated emission limits; general requirements

§ 15.209 (a)

Measurement with Peak-Detector (green line) and Average-Detector (magenta line):

Frequency: 24,8 GHz, middle antenna



Peak List:

Frequency [MHz]	QP Level [dBµV]	Limit [dBµV]	Margin [dB]	Antenna polarization
231,25	42,43	46,00	3,57	Vertical
606,20	22,83	46,00	23,17	Vertical
620,45	21,99	46,00	24,01	Vertical
701,30	23,35	46,00	22,65	Vertical
789,15	25,21	46,00	20,79	Horizontal
877,05	27,39	46,00	18,61	Horizontal
886,60	27,15	46,00	18,85	Horizontal
935,50	28,93	46,00	17,07	Horizontal
936,40	28,00	46,00	18,00	Horizontal
941,15	36,94	46,00	9,06	Horizontal

Radiated emission limits; general requirements

§ 15.209 (a)

Measurement with Peak-Detector (green line) and Average-Detector (magenta line):

Frequency: 24,8 GHz, middle antenna



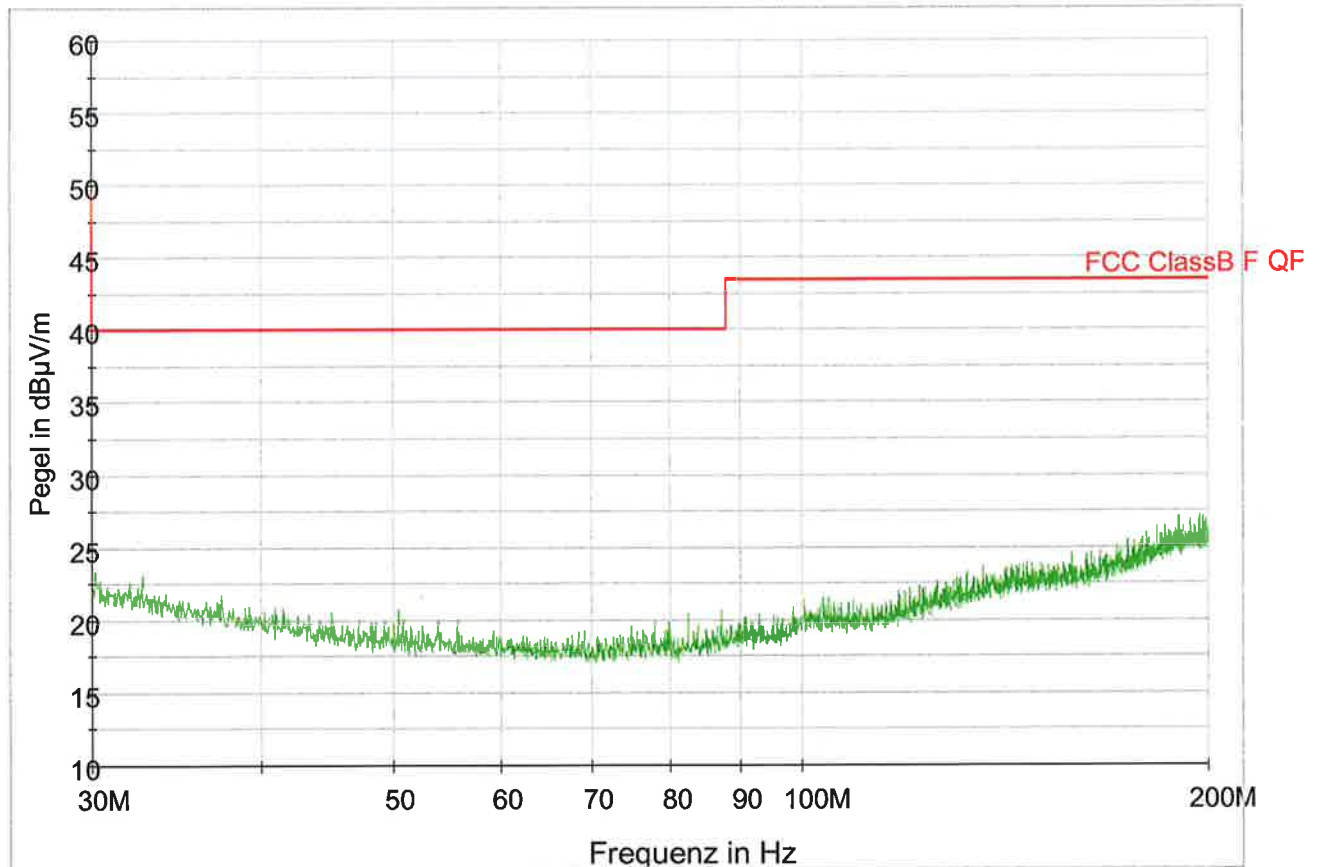
Preview Result 2-AVG Preview Result 1-PK+ FCC ClassB F-PK FCC Part 15 Class B Electric Field Strengt

Radiated emission limits; general requirements

§ 15.209 (a)

Measurement with Peak-Detector (green line) and Average-Detector (magenta line):

Frequency: 24,8 GHz, largest antenna



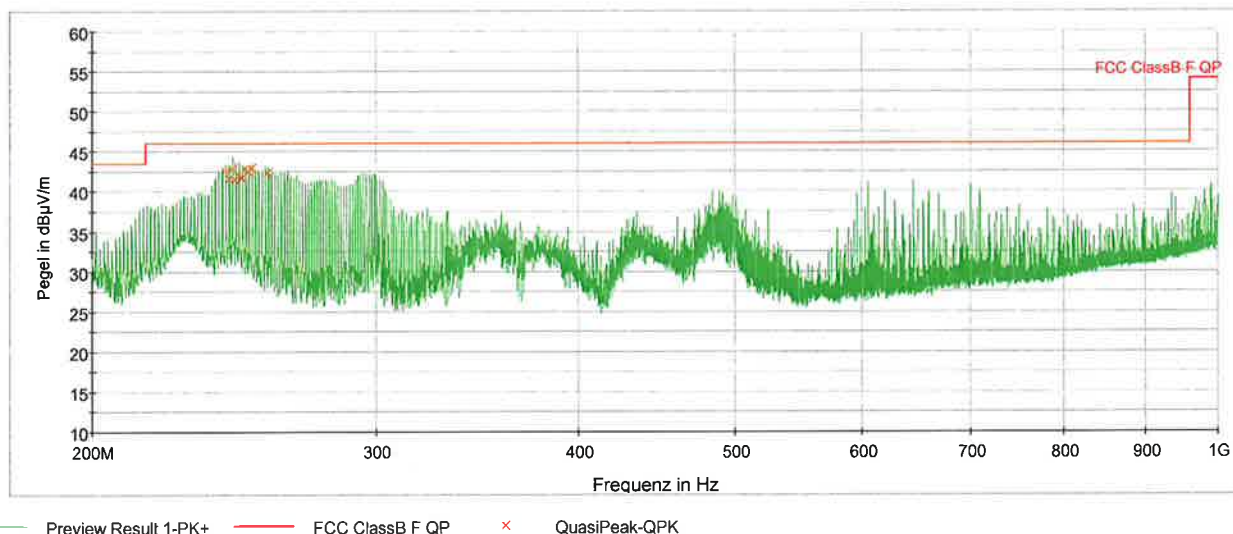
— Preview Result ~~1-PK~~+FCC ClassB F QP QuasiPeak-QPK

Radiated emission limits; general requirements

§ 15.209 (a)

Measurement with Peak-Detector (green line) and Average-Detector (magenta line):

Frequency: 24,8 GHz, largest antenna



Peak List:

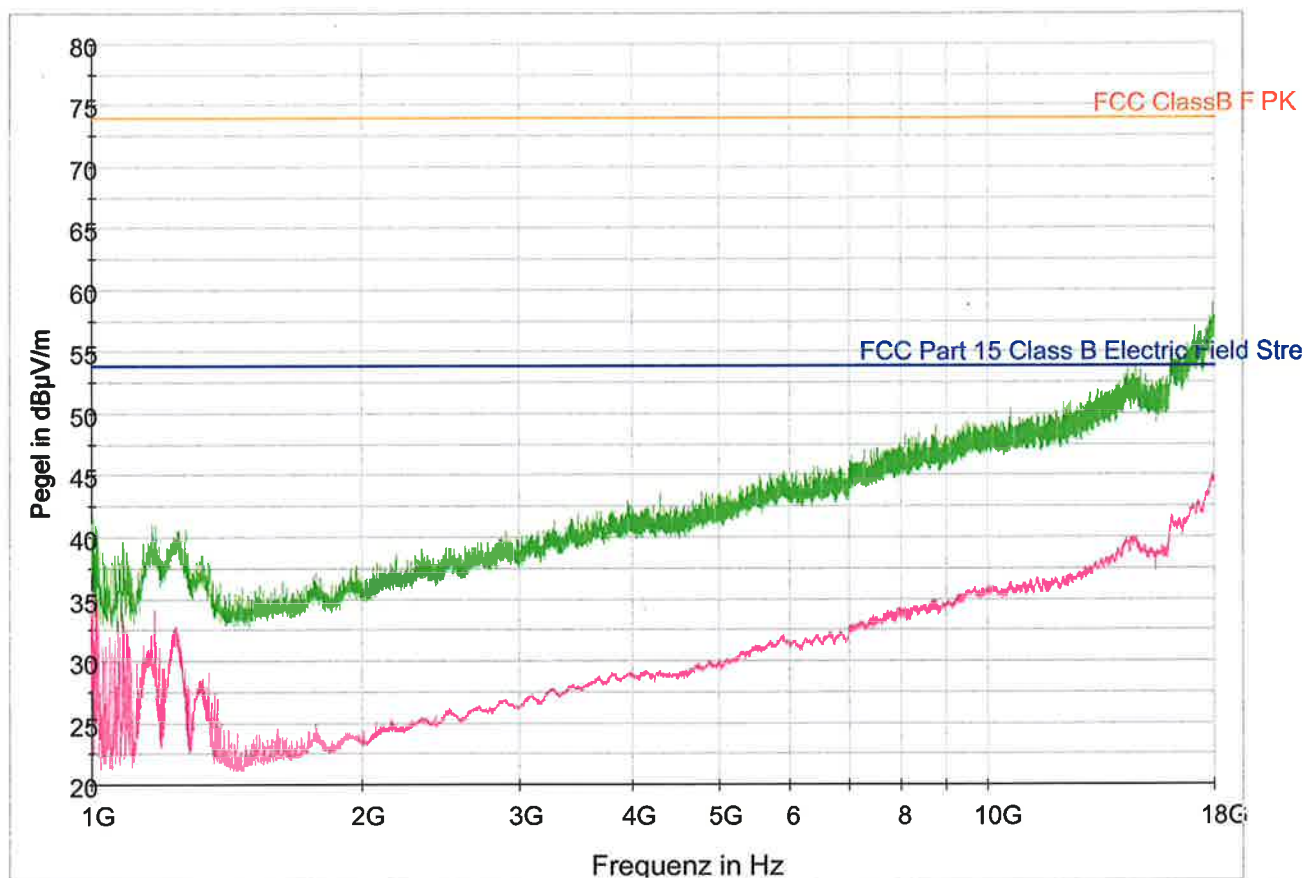
Frequency [MHz]	QP Level [dBµV]	Limit [dBµV]	Margin [dB]	Antenna polarization
242,05	42,55	46,00	3,45	Horizontal
243,25	41,61	46,00	4,39	Horizontal
244,40	42,83	46,00	3,17	Horizontal
245,60	41,53	46,00	4,47	Horizontal
246,75	41,94	46,00	4,06	Horizontal
247,90	41,80	46,00	4,20	Horizontal
249,05	42,83	46,00	3,17	Horizontal
250,25	42,51	46,00	3,49	Horizontal
251,40	42,95	46,00	3,05	Horizontal
257,25	42,39	46,00	3,61	Horizontal

Radiated emission limits; general requirements

§ 15.209 (a)

Measurement with Peak-Detector (green line) and Average-Detector (magenta line):

Frequency: 24,8 GHz, largest antenna



Preview Result 2-AVG Preview Result 1-PK+ FCC ClassB F-PK- FCC Part 15 Class B Electric Field Strengt

Radiated emission limits; general requirements

§ 15.209 (a)

Frequency: 24,8 GHz

Frequency [GHz]	Field strength level @ 3m distance [dBµV/m]						Limit [dBµV/m]	
	Smallest Antenna		Middle Antenna		Largest Antenna		Limit [dBµV/m]	
	AV	PK	AV	PK	AV	PK	AV	PK
24,8	53,80	73,82	51,30	71,32	49,20	69,22	54,0	74,0
49,6	No emission above noise level found						54,0	74,0
74,4							54,0	74,0
99,2							54,0	74,0

Due to the low emission level, measurements above 18 GHz were made at a measurement distance of 30cm and the results were extrapolated to the level at 3m distance by an extrapolation factor of 20dB per decade.

Appendix 1

Test equipment used

☐	Anechoic Chamber with 3m measurement distance	NT-100	☐	ESVP - Test receiver 20 - 1000 MHz	NT-201
☐	Stripline according to ISO 11452-5	NT-108	☐	ESCI - Test receiver 9 kHz - 7 GHz	NT-203/1
☐	MA4000 - Antenna mast 1 - 4 m height	NT-110/1	☐	ESI26 - Test receiver 20 Hz - 26,5 GHz	NT-207
☐	DS - Turntable 0 - 400 ° Azimuth	NT-111/1	☐	Digital Radio Tester CTS55	NT-208
☐	CO3000 Controller Mast+Turntable	NT-112/1	☐	Noise-gen., ITU-R 559-2 20 Hz - 20 kHz	NT-209
☐	HUF-Z3 - Log. Per. Antenna 200 - 1000 MHz	NT-121	☐	CMTA - Radiocommunication analyzer ; 0,1 - 1000 MHz	NT-210
☐	HFH-Z2 - Loop Antenna 9 kHz - 30 MHz	NT-122	☐	3271 - Spectrum analyzer 100 Hz - 26,5 GHz	NT-211
☐	HFH-Z6 - Rod Antenna 9 kHz - 30 MHz	NT-123	☐	Digital Radio Tester Aeroflex 3920	NT-212/1
☐	3121C - Dipole Antenna 28 - 1000 MHz	NT-124	☐	2855S - Communication analyzer	NT-213
☐	3115 - Horn Antenna 1 - 18 GHz (immunity)	NT-125	☐	Mixer M28HW 26,5 GHz - 40 GHz	NT-214
☐	3116 - Horn Antenna 18 - 40 GHz	NT-126	☐	Diode Detector 0,01 GHz - 26,5 GHz	NT-215
☐	SAS-200/543 - Bicon. Antenna 20 MHz - 300 MHz	NT-127	☐	RubiSource T&M Timing reference	NT-216
☐	AT-1080 - Log. Per. Antenna 80 - 1000 MHz	NT-128	☐	Radiocommunication analyzer SWR 1180 MD	NT-217
☐	HK-116 - bicon. Antenna 20 MHz - 300 MHz	NT-129	☐	Mixer M19HWD 40 GHz - 60 GHz	NT-218
☐	HK-116 - bicon. Antenna 20 MHz - 300 MHz	NT-130	☐	Mixer M12HWD 60 GHz - 100 GHz	NT-219
☐	3146 - Log. Per. Antenna 200 - 1000 MHz	NT-131	☐	DSO9104 Digital scope	NT-220/1
☐	Loop Antenna H-Field	NT-132	☐	TPS 2014 Digital scope	NT-222
☐	Horn Antenna 500 MHz - 2900 MHz	NT-133	☐	Artificial Ear according to IEC 60318	NT-224
☐	Horn Antenna 500 MHz - 6000 MHz	NT-133/1	☐	1 kHz Sound calibrator	NT-225
☐	Log. per. Antenna 800 MHz - 2500 MHz	NT-134	☐	B10 - Harmonics and flicker analyzer	NT-232
☐	Log. per. Antenna 800 MHz - 2500 MHz	NT-135	☐	SRM-3000 Spectrum analyzer	NT-233
☐	BiConiLog Antenna 26 MHz - 2000 MHz	NT-137	☐	SRM-3006 Spectrum analyzer	NT-233/1a
☐	Conical Dipol Antenna PCD8250	NT-138	☐	E-field probe SRM 75 MHz - 3 GHz	NT-234
☐	HF 906 - Horn Antenna 1 - 18 GHz (emission)	NT-139	☐	Field Meter NBM-500 incl. E- and H-Field probes	NT-240a-d
☐	HZ-1 Antenna tripod	NT-150	☐	Hall-Teslameter ETM-1	NT-241
☐	BN 1500 Antenna tripod	NT-151	☐	EFA-3 H-field- / E-field probe	NT-243
☐	Ant. tripod for EN61000-4-3 Model TP1000A	NT-156	☐	Field Meter EMR-200 100 kHz - 3 GHz	NT-244
☐	Power quality analyzer Fluke 1760 (complete set)	NT-160 - NT-172	☐	E-field probe 100 kHz - 3 GHz	NT-245
☐	Spectrum analyzer - FSP7 9 kHz - 7 GHz	NT-200	☐	H-field probe 300 kHz - 30 MHz	NT-246

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Appendix 1 (continued)

Test equipment used

☐	E-field probe 3 MHz – 18 GHz	NT-247	☐	VCS 500-M6 Surge-Generator	NT-326
☐	H-field probe 27 MHz – 1 GHz	NT-248	☐	BTA-250 - RF-Amplifier 9 kHz - 220 MHz / 250 W	NT-330
☐	ELT-400 1 Hz – 400 kHz	NT-249	☐	T82-50 RF-Amplifier 2 GHz – 8 GHz	NT-331
☐	MDS 21 - Absorbing clamp 30 - 1000 MHz	NT-250	☐	500W1000M7 - RF-Amplifier 80 - 1000 MHz / 500 W	NT-332
☐	FCC-203I EM Injection clamp	NT-251	☐	AS0102-65R - RF-Amplifier 1 GHz - 2 GHz	NT-333
☐	FCC-203I-DCN Ferrite decoupling network	NT-252	☐	APA01 – RF-Amplifier 0,5 GHz – 2,5 GHz	NT-334
☐	PR50 Current Probe	NT-253	☐	Preamplifier 1 GHz - 4 GHz	NT-335
☐	PR630 Current Probe	NT-254	☐	Preamplifier for GPS MKU 152 A	NT-336
☐	Fluke 87 V True RMS Multimeter	NT-260	☐	Preamplifier 100 MHz – 23 GHz	NT-337
☐	Model 2000 Digital Multimeter	NT-261	☐	DC Block 10 MHz – 18 GHz Model 8048	NT-338
☐	Fluke 87 V Digital Multimeter	NT-262/1	☐	2-97201 Electronic load	NT-341
☐	ESH2-Z5-U1 Artificial mains network 4x25A	NT-300	☐	TSX3510P - Power supply 0-30 V / 0 - 10 A	NT-344
☐	ESH3-Z5-U1 Artificial mains network 2x10A	NT-301	☐	TSX3510P - Power supply 0-30 V / 0 - 10 A	NT-345
☐	ESH3-Z6-U1 Artificial mains network 1x100A	NT-302	☐	VDS 200 Mobil-impuls-generator	NT-350
☐	ESH3-Z6-U1 Artificial mains network 1x100A	NT-302a	☐	LD 200 Mobil-impuls-generator	NT-351
☐	PHE 4500/B Power amplifier	NT-304	☐	MPG 200 Mobil-Impuls-Generators	NT-352
☐	EZ10 T-Artificial Network	NT-305	☐	EFT 200 Mobil-impuls-generator	NT-353
☐	SMG - Signal generator 0,1 - 1000 MHz	NT-310	☐	AN 200 S1 Artificial Network	NT-354
☐	SMA100A - Signal generator 9 kHz - 6 GHz	NT-310/1	☐	FP-EFT 32M 3 ph. Coupling filter (Burst)	NT-400/1
☐	PM 5518 TXVPS Video generator	NT-311	☐	PHE 4500 - Mains impedance network	NT-401
☐	RefRad Reference generator	NT-312	☐	IP 6.2 Coupling filter for data lines (Surge)	NT-403
☐	SMP 02 Signal generator 10 MHz - 20 GHz	NT-313	☐	TK 9421 High Power Volt. Probe 150 kHz - 30 MHz	NT-409
☐	40 MHz Arbitrary Generator TGA1241	NT-315	☐	ESH2-Z3 - Probe 9 kHz - 30 MHz	NT-410
☐	Artificial mains network NSLK 8127-PLC	NT-316	☐	IP 4 - Capacitive clamp (Burst)	NT-411
☐	PEFT - Burst generator up to 4 kV	NT-320	☐	Highpass-Filter 100 MHz – 3 GHz	NT-412
☐	ESD 30 System up to 25 kV	NT-321	☐	Highpass-Filter 600 MHz – 4 GHz	NT-413
☐	PSURGE 4.1 Surge generator	NT-324	☐	Highpass-Filter 1250 MHz – 4 GHz	NT-414
☐	TRANSIENT 1000 Immunity test system	NT-325	☐	Highpass-Filter 1800 MHz – 16 GHz	NT-415

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Appendix 1 (continued)

Test equipment used

☐	Highpass-Filter 3500 MHz – 18 GHz	NT-416	☐	FCC-801-S25 Coupling decoupling network	NT-462
☐	RF-Attenuator 10 dB DC – 18 GHz / 50 W	NT-417	☐	FCC-801-T4 Coupling decoupling network	NT-463
☐	RF-Attenuator 6 dB DC – 18 GHz / 50 W	NT-418	☐	FCC-801-C1 Coupling decoupling network	NT-464
☐	RF-Attenuator 3 dB DC – 18 GHz / 50 W	NT-419	☐	F-16A - Current probe 1kHz - 70MHz	NT-465
☐	RF-Attenuator 20 dB DC - 1000 MHz / 25 W	NT-421	☐	95242-1 – Current probe 1 MHz – 400 MHz	NT-468
☐	RF-Attenuator 30 dB DC - 1000 MHz / 1 W	NT-423	☐	94106-1L-1 – Current probe 100 kHz – 450 MHz	NT-471
☐	RF-Attenuator 30 dB	NT-424	☐	GA 1240 Power amplifier according to EN 61000-4-16	NT-480
☐	RF-Attenuator 6 dB DC - 1000 MHz / 1 W	NT-425	☐	Coupling networks according to EN 61000-4-16	NT-481 - NT-483
☐	RF-Attenuator 6 dB DC - 1000 MHz / 1 W	NT-426	☐	Van der Hoofden Test Head	NT-484
☐	RF-Attenuator 6 dB	NT-428	☐	PC P4 3 GHz Test computer	NT-500
☐	RF-Attenuator 0 dB - 81 dB	NT-429	☐	PC P4 1700 MHz Notebook	NT-505
☐	WRU 27 - Band blocking 27 MHz	NT-430	☐	Monitoring camera with Monitor	NT-511
☐	WHJ450C9 AA - High pass 450 MHz	NT-431	☐	ES-K1 Version 1.71 SP2 Test software	NT-520
☐	WHJ250C9 AA - High pass 250 MHz	NT-432	☐	EMC32 Version 9.01 Test software	NT-520/1
☐	RF-Load 150 W	NT-433	☐	SRM-TS Version 1.3 software for SRM-3000	NT-522
☐	Impedance transducer 1:4 ; 1:9 ; 1:16	NT-435	☐	SRM-TS Version 1.2 software for SRM-3006	NT-522/1
☐	RF-Attenuator DC – 18 GHz 6 dB	NT-436	☐	SPS-PHE Test software V2.5 voltage fluctuations/harmonics	NT-525
☐	RF-Attenuator DC – 18 GHz 6 dB	NT-437	☐	SPS-EM Test software V4.0 EN61000-4-11	NT-527
☐	RF-Attenuator DC – 18 GHz 10 dB	NT-438	☐	Noise power test apparatus according to EN 55014	NT-530
☐	RF-Attenuator DC – 18 GHz 20 dB	NT-439	☐	Vertical coupling plane (ESD)	NT-531
☐	I+P 7780 Directional coupler 100 - 2000 MHz	NT-440	☐	Test cable #4 for EN 61000-4-6	NT-553
☐	ESH3-Z2 - Pulse limiter 9 kHz - 30 MHz	NT-441	☐	Test cable #3 for conducted emission	NT-554
☐	Power Divider 6 dB/1 W/50 Ohm	NT-443	☐	Test cable #5+#6 ESD-cable (2x470k)	NT-555 + NT-556
☐	Directional coupler 0,1 MHz – 70 MHz	NT-444	☐	Test cable #8 Sucoflex 104EA	NT-559
☐	Directional coupler 0,1 MHz – 70 MHz	NT-445	☐	Test cable #9 (for outdoor measurements)	NT-580
☐	Tube imitations according to EN 55015	NT-450	☐	Test cable #10 (for outdoor measurements)	NT-581
☐	FCC-801-M3-16A Coupling decoupling network	NT-458	☐	Test cable #13 Sucoflex 104PE	NT-584
☐	FCC-801-M2-50A Coupling decoupling network	NT-459	☐	Test cable #21 for SRM-3000	NT-592
☐	FCC-801-M5-25 Coupling decoupling network	NT-460	☐	Shield chamber	NT-600
☐	FCC-801-AF10 Coupling decoupling network	NT-461	☐	Climatic chamber	M-1200

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